Programming Languages

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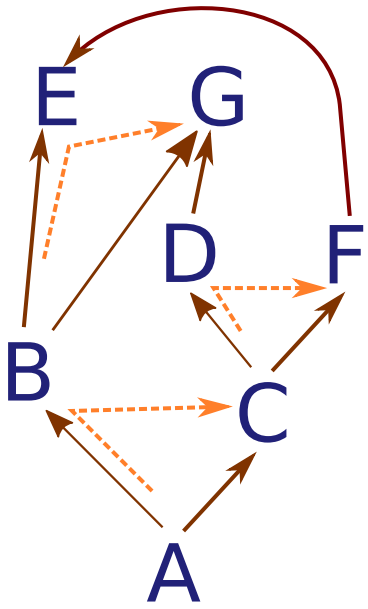
Exercise Sheet 7

Assignment 7.1 Linearization I

Consider the following inheritance expressions: `A(B,C)` `B(E,G)` `C(D,F)` `D(G)` `F(E)`
Give the linearization order for `A` of the following methods:

1. Leftmost Preorder Depth-First Search with Duplicate Cancelation
2. C3

Suggested Solution 7.1



1. DFS:$ABEGCDGFE$
   $L(A) = ABCDGFE$
2. $L(D) = DG, L(F) = FE$
   $L(C) = C \cdot [DG] \cdot [FE] \cdot [DF] = CDGFE$
   $L(B) = BEG$
   $L(A) = A \cdot [BEG] \cdot [CDGFE] \cdot [BC] = ABCD \cdot [EG] \cdot [GFE]$ error

Assignment 7.2 Linearization II

Consider the following classes: `A(B,C)` `B(D,E)` `C(F,G)` `D(G)` `E(F)`
Give the linearization order for `A` of the following methods:

1. LPDFS with Duplicate Cancellation
2. Reverse Postorder Rightmost DFS
3. C3

Suggested Solution 7.2

1. $L[A] = ABDECFG$
   Principles 1 and 2 are satisfied! However, the extension principle (aka monotonicity) is not satisfied: $L[B] = BDGEF$ from which we derive that $G \rightarrow F$ holds but this is not the case for $L[A]$ where $F \rightarrow G$ holds.

2. Same as for LPDFS with Duplicate Cancellation

3. $$\begin{array}{lcl} L[F] & = & F \\ L[G] & = & G \\ L[E(F)] & = & EF \\ L[D(G)] & = & DG \\ L[C(F,G)] & = & C \cdot \bigsqcup(F, G, FG) = CFG \\ L[B(D,E)] & = & B \cdot \bigsqcup(DG, EF, DE) = BDGEF \\ L[A(B,C)] & = & A \cdot \bigsqcup(BDGEF, CFG, BC) = ABDC \cdot \bigsqcup(GEF, FG) = \text{fail} \end{array}$$

Assignment 7.3 (Multiple) Inheritance

1. Consider the following C++-Classes:

```
class A            { public: int a; virtual void f(); }
class B : public A { public: int b; virtual void f(); }
class C : public B { public: int c; virtual void f(); }
```

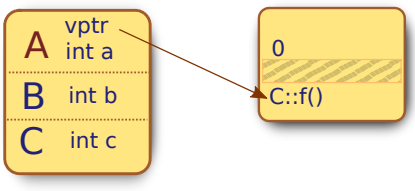
   Draw a memory representation diagram for a C-Object, and the virtual table diagram for class C!

2. Consider the following C++-Classes:

```
class A                       { public: int a; void f(); }
class B : public A            { public: int b; void f(); }
class C                       { public: int c; void f(); }
class D : public C, public B  { public: int d; void f(); }
```

   Draw a memory representation diagram for a D-Object!

Suggested Solution 7.3

1. 

2.